January 25, 1866.

Lieutenant-General SABINE, President, in the Chair.

In accordance with the announcement made from the Chair at the last Meeting, the President read letters from Dr. William Bird Herapath, explaining the reason for non-payment of his annual contribution; and the question of his readmission was put to the vote, and was decided in the affirmative. The President accordingly declared that Dr. Herapath was readmitted into the Society.

The following communication was read:—

"Note on the Secular Change of Magnetic Dip, as recorded at the Kew Observatory." By BALFOUR STEWART, M.A., LL.D., F.R.S., Superintendent of the Observatory. Received January 10, 1866.

The President of this Society has already called the attention of the Fellows to the annual values of the magnetic inclination at Toronto, as deduced from the monthly determinations. In doing so he remarked that "the general effect of the disturbances of the inclination at Toronto is to increase what would otherwise be the amount of that element; therefore, if the disturbances have a decennial period, the absolute values of the inclination (if observed with sufficient delicacy) ought to show in their annual means a corresponding decennial variation, of which the minimum should coincide with the year of minimum disturbance, and the maximum with the year of maximum disturbance." At Toronto, where the true secular change is very small, the effect of this superimposed variation is very visible, so that the yearly values of the inclination appear to increase up to the period of maximum disturbance and to decrease after it. At Kew the general effect of disturbances is probably the same as at Toronto—that is to say, tending to increase the inclination; but the secular change being considerable, and tending to decrease the inclination, the joint effect of the secular change and the superposed variation might be expected to appear in a diminution of the yearly secular change for those years during which the disturbances are increasing from their minimum to their maximum value, and in an increase of the yearly secular change for those years during which the disturbances are decreasing from their maximum to their minimum.

The Kew records appear to exhibit a variation of this nature. Observations of dip were commenced at the Kew Observatory in 1854; and by comparing a good number of observations taken during the latter months of 1854, with two circles and four needles, with observations taken with the same circles and needles during the same months of 1855, we obtain a yearly secular change of $2'{\cdot}24$.

During the years from 1856 to 1859 inclusive, monthly observations were made with a circle known as the Kew circle, two needles being always used, and the mean of the two results taken as the true value of the dip.

From this circle we have the following results:—

Year.	Mean dip.	Yearly secular change.
1856.	68° 27·67	
1857.	24·36	3·31
1858.	22·80	1·56
1859.	20·73	2·07

If we take the mean of these three values of yearly secular change, and also include that between 1854 and 1855, we have a mean value of yearly secular change, for the period between 1854 and 1859, amounting to 2′·29, and this value will not be sensibly altered if we omit the observations between 1854 and 1855.

In 1859 it was resolved to substitute another circle for the Kew circle, as the action of the latter was not considered to be quite satisfactory; and accordingly since this date Barrow's circle No. 33 has been employed, and monthly observations have been made with it, generally in the afternoon—two needles being used, as before.

From this circle we have the following results:—

Year.	Mean dip.	Yearly secular change.
1860.	68° 20·21	
1861.	18·21	2·00
1862.	15·58	2·63
1863.	12·66	2·92
1864.	9·88	2·78

exhibiting between 1860 and 1864 a mean secular change of 2′·58.

It will be noticed from this, that the mean yearly secular change of dip at Kew appears to be greater from 1860 to 1864, a period of increasing disturbances, than from 1854 to 1859, a period of decreasing disturbances. Possibly the yearly decrement of dip has again begun to diminish, since the change from 1864 to 1865 is only 1′·32. It is, however, premature to assert that this is the case, and it can only be decided by continuing the monthly observations. At all events the Kew observations agree with those at Toronto in indicating that the yearly change of dip contains the combined result of two things—namely, the true secular change and the change due to disturbance; and this ought to be borne in mind by future observers of this magnetic element.